

FIRST RECORD OF *CLIMACIA CALIFORNICA* (NEUROPTERA: SISYRIDAE)
AND ITS HOST SPONGE, *EPHYDATIA MULLERI* (PORIFERA: SPONGILLIDAE),
FROM IDAHO WITH WATER QUALITY RELATIONSHIPS

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ABSTRACT— The spongillally, *Climacia californica* Chandler, and its sponge host, *Ephydatia mulleri* (Lieberkuhn), are reported from the state of Idaho for the first time. *Climacia californica* has not previously been reported from *E. mulleri*. Collections were made in the Burley–Twin Falls area, and detailed water quality data are provided for the first time for spongillally larvae. The water quality data also expand the known tolerance limits of *E. mulleri* for water temperature, conductivity, pH, hardness, silica, and residue.

On 16 July 1980, six larvae of *Climacia californica* Chandler were collected in the Snake River (near River Mile 653.7) at Heyburn, Minidoka County, Idaho, at an elevation of 1265 m (Fig. 1). The Snake River at this point is part of Milner Lake, due to Milner Dam,

which is located approximately 21 km downstream to the west.

The spongillafly larvae were collected on the surfaces of the crustose sponge, *Ephydatia mulleri* (Lieberkuhn) (Fig. 2). The sponges were found near shore growing on the under-



Fig. 1. Snake River at Heyburn, Idaho. Habitat of *Climacia californica* and *Ephydatia mulleri*.

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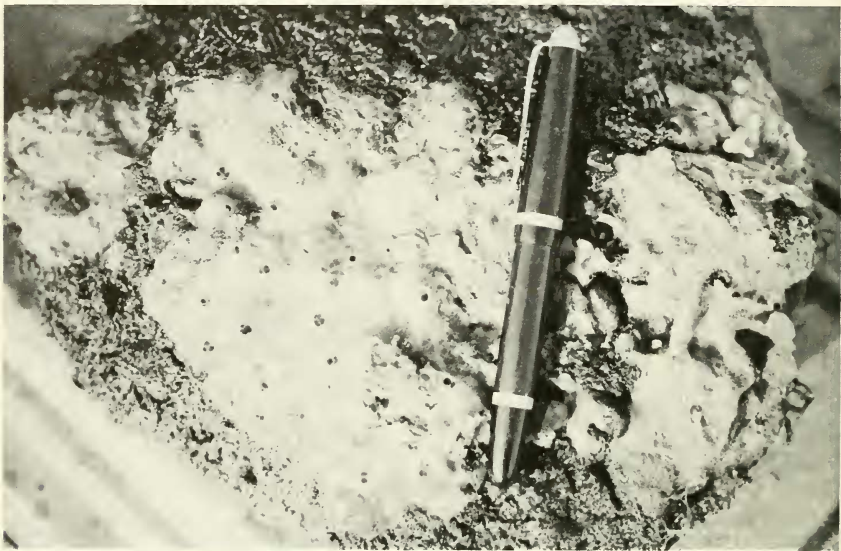


Fig. 2. The sponge *Ephydatia mulleri* from the Snake River near Heyburn. Scale: Pen is 13 cm in length.

side of rocks, bricks, and pieces of concrete and asphalt in approximately 0.25–0.5 m of water (Fig. 1).

MATERIALS AND METHODS

Specimens were hand collected by pulling up rocks and debris and preserved in 70% alcohol. Voucher specimens of *C. californica* are deposited in the Orma J. Smith Museum of Natural History, College of Idaho, Caldwell (CIDA); the Entomology Collection, University of Idaho, Moscow (UI); the Department of Biology, Boise State University, Boise, Idaho (BSU); and in the private collections of A. D. Allen and R. C. Biggam. Specimens of *E. mulleri* are deposited in the collections of the O. J. Smith Museum of Natural History, College of Idaho, Caldwell (CIDA) and the Department of Biology, University of New Orleans, New Orleans, Louisiana.

Water quality and quantity data were collected and analyzed by the U.S. Geological Survey in accordance with their standard procedures, as well as with "Standard Methods" (American Public Health Association 1971).

RESULTS AND DISCUSSION

The aquatic neuropterous family Sisyridae has not previously been reported from Idaho. *Climacia californica* was originally described from California (Chandler 1953) and was previously known from only California and Oregon (Chandler 1963). The species determination of the Idaho specimens is based on comparisons of the larvae with the illustrations of Brown (1952) and Chandler (1953) and on a collection of adults taken by sweeping shoreline vegetation at Echo Lake near the Snake River at Twin Falls, Twin Falls County, by Albert D. Allen 13 July 1976. Additional specimens were collected at this locality by R. C. Biggam 22 July 1976 and by R. C. Biggam and L. R. Schoenike 19 August 1982. Twin Falls is approximately 42 river km downstream from the Heyburn locality.

The sponge, *E. mulleri*, is listed as widely distributed in the Northern Hemisphere by a variety of workers (Gurney and Purfin 1959, Pennak 1953, Penney 1960, and Penney and Racek 1968, to list a few) but has apparently not been reported from Idaho.

TABLE 1. Water quality parameters for the Snake River near Burley, Idaho 1974-1981.¹

| Parameter | Units | (N) | Mean | Standard Deviation | Maximum | Minimum |
|---|----------|-----|---------|--------------------|----------|---------|
| Water temperature | CENT | 70 | 10.20 | 7.10 | 23.00 | 0.00 |
| Flow | CFS | 69 | 6519.30 | 4590.01 | 21300.00 | 390.00 |
| Turbidity | JTU | 44 | 6.30 | 4.32 | 22.00 | 1.00 |
| Conductivity | Micromho | 70 | 447.0 | 71.08 | 842.00 | 351.00 |
| Dissolved oxygen | MG/L | 67 | 10.60 | 1.96 | 14.50 | 6.80 |
| DO saturation | Percent | 61 | 107.00 | 16.52 | 163.00 | 59.00 |
| COD low level | MG/L | 33 | 12.70 | 13.28 | 77.00 | 0.00 |
| COD high level | MG/L | 31 | 12.80 | 8.36 | 38.00 | 0.00 |
| pH | SU | 68 | 8.20 | 0.49 | 8.90 | 6.30 |
| Carbon dioxide | MG/L | 42 | 1.90 | 1.46 | 7.20 | 0.50 |
| Total alkalinity as CaCO ₃ | MG/L | 47 | 160.00 | 20.55 | 202.00 | 124.00 |
| HCO ₃ ion HCO ₃ | MG/L | 41 | 189.00 | 23.92 | 230.00 | 150.00 |
| CO ₃ ion CO ₃ | MG/L | 40 | 4.00 | 5.56 | 22.00 | 0.00 |
| Total nitrogen as N | MG/L | 70 | 0.95 | 1.10 | 8.40 | 0.20 |
| Organic nitrogen as N | MG/L | 70 | 0.60 | 0.93 | 7.80 | 0.02 |
| Ammonia total-NH ₄ | MG/L | 22 | 0.06 | 0.07 | 0.27 | 0.00 |
| NH ₃ + NH ₄ - N total | MG/L | 70 | 0.05 | 0.05 | 0.25 | 0.00 |
| Total Kjeldahl nitrogen | MG/L | 70 | 0.63 | 0.94 | 7.90 | 0.05 |
| NO ₂ and NO ₃ N total | MG/L | 70 | 0.32 | 0.46 | 3.10 | 0.00 |
| Total PO ₄ PO ₄ | MG/L | 4 | 0.08 | 0.05 | 0.15 | 0.03 |
| Phosphorus total | MG/L | 70 | 0.06 | 0.03 | 0.14 | 0.01 |
| Total organic carbon | MG/L | 49 | 2.96 | 1.32 | 7.00 | 1.40 |
| Total hardness as CaCO ₃ | MG/L | 12 | 165.83 | 53.17 | 190.00 | 0.00 |
| Calcium dissolved | MG/L | 11 | 47.00 | 3.44 | 51.00 | 42.00 |
| Magnesium dissolved | MG/L | 11 | 15.60 | 1.12 | 17.00 | 14.00 |
| Sodium dissolved | MG/L | 11 | 19.30 | 2.80 | 23.00 | 15.00 |
| Potassium dissolved | MG/L | 11 | 3.40 | 0.34 | 4.00 | -2.90 |
| Chloride total | MG/L | 11 | 18.54 | 3.93 | 23.00 | 13.00 |
| Sulfate total | MG/L | 11 | 41.80 | 8.27 | 58.00 | 27.00 |
| Silica dissolved | MG/L | 49 | 14.80 | 5.65 | 25.00 | 3.00 |
| Arsenic total | µG/L | 53 | 3.40 | 1.08 | 7.00 | 1.00 |
| Cadmium total | µG/L | 53 | 5.40 | 4.74 | 12.00 | 0.00 |
| Chromium total | µG/L | 52 | 2.70 | 4.36 | 10.00 | 0.00 |
| Copper total | µG/L | 53 | 36.50 | 48.62 | 170.00 | 2.00 |
| Iron total | µG/L | 53 | 259.00 | 186.27 | 1100.00 | 10.00 |
| Lead total | µG/L | 53 | 55.70 | 44.08 | 100.00 | 0.00 |
| Zinc total | µG/L | 53 | 45.30 | 65.19 | 420.00 | 0.00 |
| Mercury total | µG/L | 53 | 0.10 | 0.18 | 1.10 | 0.00 |
| Selenium total | µG/L | 50 | 0.30 | 0.51 | 2.00 | 0.00 |
| Fecal coliform bacteria | /100 ML | 53 | 30.00 | 25.56 | 86.99 | 0.00 |
| Suspended solids at 150 C | MG/L | 26 | 14.90 | 17.07 | 87.00 | 2.00 |
| Residue suspended at 180 C | MG/L | 14 | 17.90 | 16.59 | 59.00 | 3.00 |
| Residue dissolved at 180 C | MG/L | 50 | 264.00 | 34.06 | 338.00 | 201.00 |

¹Data from U. S. Geological Survey (1975-1982).

Little has been reported concerning the water quality requirements of spongillafies. Roback (1974) describes the larvae of Sisyridae as not especially tolerant of extremes of water chemistry. He goes on to state that "*Climacia areolaris* was found at alkalinity greater than 210 ppm, total hardness greater than 300 ppm, and sulfate greater than 400 ppm." The mean alkalinity at the Burley Snake River station was 160 mg/l (mg/l = ppm) with a range of 124-202 mg/l; mean total hardness was 165.83 mg/l (range 0-190 mg/l);

and the mean sulfate concentration was 41.8 mg/l (range 27-58 mg/l) (Table 1). In addition, Table 1 provides, for the first time, detailed water quality information pertaining to this insect.

Harrison (1974) summarized the available water quality data for the sponge, *E. mulleri*. He listed the following ranges of parameters for which I have comparable data; conductivity 31-100 micromhos/cm; total hardness 60-160 mg/l; pH 6.1-8.5; residue 42-75 mg/l; S:O₂ 0.7-11.6 mg/l; and temperatures of

16–24 C. Data for the above parameters from the Snake River, Burley station, are as follows: conductivity, \bar{X} = 447 micromhos/cm (range 351–842); total hardness, \bar{X} = 165.83 mg/l (range 0–190); pH, \bar{X} = 8.2 (range 6.3–8.9); silica, \bar{X} = 14.8 mg/l (range 3–25); and temperature, \bar{X} = 10.2 C (range 0–23). The term *residue* listed in Harrison (1974) could refer to several forms (Table 1). Suspended solids is one of the most commonly used measurements of residue and for the Snake River station had a range of 2–87 mg/l (\bar{X} = 14.9). The Snake River data thus expands the known water quality tolerances of *E. mulleri* for temperature, conductivity, pH, hardness, silica, and residue.

Table 1 lists 33 additional water quality parameters that have not been previously reported for either *C. californica* or *E. mulleri*.

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